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## The Relation between Self-Citation and Impact Factor in Medical Science Open Access Journals in ISI & DOAJ Databases

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**Abstract:** Citation is one of the important elements in scientific literature which has a significant role in information production and generation. Self-citation is a part of citation behavior. Relying on their articles, journals can change the number of citations and consequently the level of journal impact factor. This research aims at investigating the relation between self-citation and impact factor in the open access journals indexed in ISI and DOAJ in medical science in 2007-08. In this research, indexes such as the relation between self-citation of journal and impact factor and the effect of self-citation rate of the journal in open access performance are investigated. Research method is an analytical method conducted by using citation analysis technique. SPSS statistical software was used to examine and analyze the data and its inferential analysis methods such as Pierson Factor were used as well. Statistical society includes 168 journals. The results showed a self-citation rate of 28% for the journal. The findings indicate that there is a significant relation between self-citation and impact factor. After omitting self-citation, the level of self-citation in the performance of journals showed that 60% of the titles in the medical science experienced ranking increase, 27% experienced ranking decrease and 13% remained unchanged.

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**Keywords:** Citation, Institute for Scientific Information (ISI), Directory of Open Access Journals (DOAJ), Journal Self-citation, Impact Factor, Medical Science

### 1. Introduction

Information reliability is one of the most important quality criteria in scientific works. A scientific work is based on the past resources and cannot rely on itself. Beni (2002) believes that if a scientific work has annually 5 to 10 references several years after its publication, it is likely that its contents will be integrated in the knowledge body of the relevant scientific field, in the manner that the article will contribute in increasing the scientific knowledge of that field. Citations have a special position in the scientific works. In fact, a scientific article is authentic when it cites the previous works of the relevant field. Citation is used as an index to evaluate the effect of scientific works. The more a scientific work is available, the more it will be cited and consequently, the more it will have impact. Sometimes we see self-citation in citation behaviors. For the first time, Garfield and Sher (1964) studied the quantitative approach to self-citation. According to Glanzel (2006), Mc Roberts was the first who critically studied self-citation in 1989. Self-citation includes citations in which the author of a document cites his previous work or the journal in which the document has been published. In other words, self-

citation is usually defined as a citation in which the citing and cited article has at least one common author. Self-citation may sometimes make a work difficult to impact. Although authors may have good reasons to cite their own works, these citations are not always good indications for the importance of scientific works. Citation of previous works may distort the number of citations and may reduce citation reliability as a criterion to evaluate the quality of scientific works. Editors sometimes adapt publication strategy by maximizing impact factor in the manner that in some cases they try to calculate the impact factor such that they can change it in favor of their publication. Aksnes (2006) has reported that the articles accepted by editors are returned to the authors and the authors are then asked to refer to the articles of the same journal through they are not relevant to the subject of article and this increases self-citation of the journal. For this reason, we should understand the correct ways for self-citation and the impact method of other citations by these self-citations. Modifications should be made to avoid distortion of citations so that the competence and reliability of the authors and journals remain perfect. Since self-citation in the journals is inevitable, it is

necessary to study the relation between self-citation and impact method. Therefore, the present research studies this relation in the open access journals of medical science indexed in ISI and DOAJ.

### Research Questions

Efforts are made in this research to answer the following questions:

How much is a journal's self-citation in the open access journals of medical science?

Is there any correlation between the journal's self-citation and impact factor in the open access journals of medical science?

What is the impact of self-citation on the performance of medical science journals?

According to Garfield and Sher (1964), self-citation does not show anything inauspicious if it is not in a high level. In the studies they made, they came to the conclusion that an author's self-citation is averagely 20%. In a research, Bonzi (1991) studied citation motivations and compared self-citation and citation of others. He concluded that authors' motivations in self-citation and citation of others were not highly different. In his research, Pichappan (1994) studied self-citation in astrophysics and astronomy publications and concluded that self-citer and self-cited levels were 173% and 391%, respectively. Self-citation increases in those magazines with more articles. In other words, there is a direct relation between the number of articles and the rate of self-citation. Lawrence was the first one who made researches in relation to citation in open access journals. He investigated the relation of possible free access to the complete text of the article and the number of citations received in the articles of computer science conferences in 1989-1999 in three websites, namely Scopus, ISI Thomson and SiteSeer. His researches showed that the number of citations of free access articles was 336% higher than the number of citations of the published articles. In this analysis, Lawrence assumed the quality of all studied articles to be the same. In his research, Hyland (2003) studied author's self-citation in sociological, business, philosophical, biological, psychological, mechanical and electronic journals and showed the methods used by authors for self-citation. He believes that self-citation emphasizes on thematic expertise of a person and stabilizes the author's interpretations and ideas in new findings based on previous researches. In his research, Frandsen (2007) studied the role of self-citation in analyzing the mechanism of impact factor of social science journals. He concluded that there was a positive relation between a journal's impact factor and the increase of self-citations. Variables such as geographical place and language impact on this relation as well. As indicated in that research,

self-citation factor of non-American journals is 0.00339 less than that of North American journals. Furthermore, self-citation in non-English journals is 0.0094 less than English magazines. In a research on self-citation, Krauss (2007) studied 6 ecological journals. Based on his results, 16% of the citations of those journals included self-citation. Those magazines with high impact factors had high self-citation as well. Other findings of that research showed that the authors' researches made within the recent seven years had been cited more in their works. In their research, Craig et al. (2007) studied the relation of open access journals and their self-citation. They concluded that there was a direct relation between free access and visibility of a journal and the increase of self-citations (Khachian et al., 2012; Shokati et al., 2012).

### 2. Material and Methods

Using citation analysis method, this research was made in 2007-08 on 168 journals of medical science with impact factor. For this purpose, two databases of ISI and DOAJ were referred and journals were extracted for study and the number of journal's self-citation was specified. The data was then analyzed statistically using SPSS software and correlation factor statistical test.

### 3. Results

The findings of this research for the following questions are as follows:

How much is a journal's self-citation in the open access journals of medical science?

Journal's self-citation percentage in this research was calculated as follows and the results are shown in table 1.

$$\text{Journal's self-citation rate} = 100 \times \frac{\text{No. of Journal's self-citations}}{\text{Total citations}}$$

Table 1. Journal's self-citation percentage

No. Journals	54
No. of Citations	198397
No. of Self-citations	55714
Self-citation Percentage	28%

Table 1 shows that journal's self-citation percentage in medical science is 28%.

Is there any correlation between the journal's self-citation and impact factor in the open access journals of medical science?

To answer this question, impact factor of each journal was compared to the non-self-citation impact factor of the journal which was obtained according to the following formula.

Non-self-citation impact factor of journal in 2008 = (Journal's self-citation in 2007 and 2008) – (total citations received in 2007 and 2008)/total articles of the journal in 2007 and 2008

Pierson correlation test was used to evaluate the significant relation of journal's self-citation and impact factor. The results are shown in table 3 and diagram 1.

Table 3. Correlation between the journal's self-citation and impact factor

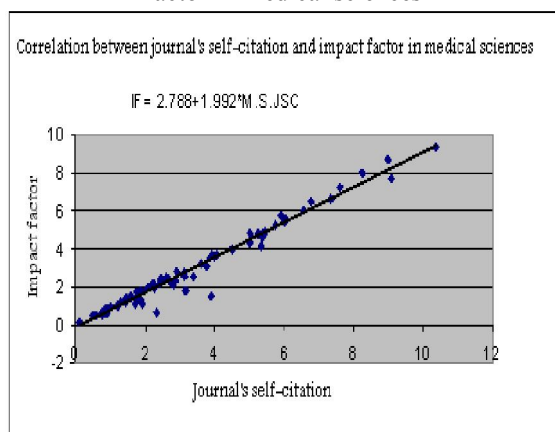
Journal's self-citation	Impact factor		
0/73/4**	1	Pierson correlation	Impact factor
0/000		P value	
161	167	Qty.	
1	0/73/4**	Pierson correlation	Journal's self-citation
	0/000	P value	
161	161	Qty.	

Correlation between journal's self-citation and impact factor in medical science is 73/4. P value is smaller than 0.01. Therefore, there is a significant correlation between self-citation and impact factor. The linear equation of this correlation is as follows:

Impact factor =  $2/788 + 1/992 \times$  journal's self-citation in medical science ( $R^2=53.8$ ,  $P < 0.01$ )

The linear equation shows that any change in the journal's self-citation will cause 1/992% change in the impact factor. Equivalent specification factor is 0.53.

Correlation between journal's self-citation and impact factor in medical sciences



The findings of this question show that based on the coefficient test, the obtained amounts of linear regression between the two variables in this field are significant and the diagram coefficient and its constant are also valid based on the tests. The results indicate that there is a high significant correlation between journal's self-citation and impact factor in medical science, in the manner that as self-citation increases, impact factor of the journal increases as well. The research made by Frandsen (2007) has confirmed this fact. In his research, he showed that there is a positive relation between journals' impact factor and self-citation, i.e., those journals with high impact factors has higher self-citation. The results indicate that the journals with high impact factors possibly tend to increase impact factor through self-citation. Increase of self-citation will be a negative effort if made without any reason and only to increase the journal's rank since in this way the works of an author are wrongly shown to be highly cited. When evaluation is made based on the number of citations and when citations show rewards, self-citation falsely increases the importance of an article in the scientific community and will potentially confuse the impact of the research. Maybe it can be said that those authors who publish their articles in highly cited open access journals tend both to increase the number of citations made by others through open access and increased visibility of the article and to stabilize their own scientific reputation and also to make prominent their previous works. On the other hand, maybe these authors highly cite their previous works due to their arrogance. Authors may tend to cite their own works to increase the number of citations or to make prominent their previous works. Anyway, self-citation motivations are issues which should be considered.

### Impact of Journal's Self-Citation on the Performance of Journals

To answer this question, the impact factor of open access journals in 2004-2005 separated based on the fields of basic sciences and their ranks were compared to non-self-citation impact factor and the relevant rank. In the following table, rank changes of journals versus non-self-citation impact factor of journal in the field studied in this research are shown.

Table No. 7. Impact of journal's self-citation on the performance of journals

No change		Negative		Positive		otal Number of Journals
Change Percentage	umber of Journals	hange Percentage	umber of Journals	hange Percentage	umber of Journals	
%3	2	%7	5	%0	01	68

According to the data of the above table, 60% of total journals enjoyed rank improvement against the impact factor of non-self-citation, 27% experienced rank decrease and 13% remained unchanged. Each journal has a rank in the citation reports database of journals based on its impact factor. Since the level of calculated impact factor is specified by inclusion of self-citation and since self-citations are sometimes a way to alter the impact factor of each journal, it can be said that self-citation should be considered in selecting any journal. In this question, the journal's rank in this scientific field was specified without considering self-citation and was then compared to the scientific level of the same journal in ISI to determine the difference between the ranks of journals with and without consideration of self-citation.

#### 4. Discussions

Citation is one of the criteria to evaluate the scientific reliability of a work. Increased self-citation of a journal or an author can have an impact on the increased rank of the journal or relevant author. But self-citation is one of the types of reference and it cannot be ignored. Each journal or author has usually a few references to its previous works. In the journals' citation reports of ISI, maximum self-citation is 20% and in other researches it is 3 to 36%. The results of the present research showed that self-citation is usual for the journals and is one of the citations but it should be made to a common extent. Self-citation of the journal and author in the studied field is 28% and 36%, respectively. According to Pierson statistical test, the relation between self-citations and impact factor in this field in open access journals was significant. Considering the findings of the research, there is a positive relation between self-citation and impact factor in medical science in open access journals. Based on the obtained results and by comparing the performances of journals before and after omission of self-citation, it was observed that 87% of the studied subjects experienced a change in their ranks and only 13% of them remained unchanged. Maybe it can be said that the number of articles and authors as well as the tendency of journal editors to increase or decrease self-citation lead to these changes in the ranks of the journals.

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